FEATURE

The Multiple-Use Concept

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ABSTRACT

The multiple-use concept, based on the assumption that some degree of diversity in use better utilizes a resource than does a single use, demands a careful study of all interrelated potentials of the resource. Three kinds of multiple-use systems are discussed. One of these, the managed beneficial multiple-use of resources, is described at length, and the many activities of the various agencies of the U.S. Department of Agriculture designed to achieve such management are also described.

The multiple-use concept may be defined as the concurrent use of natural resources for several objectives. Use of land and related water resources for ubanization, transportation, industry, agriculture, forestry, wildlife, recreation, esthetics, waste management, water storage, flood control, and open space raise issues of degree and of priorities in "managed use" versus *laissez faire.*

Biologically, there are a few almost exclusive pre-emptions of semi-closed, controlled environments such as the biologically secured laboratories at the Manned Spacecraft Center in Houston, the isolation chambers in which gnotobiotic animals are produced. But such pre-emptions are unusual and difficult to maintain. Man shares his dwellings, albeit reluctantly, with commensal rodents and insects and an insistent microflora. His cities harbor pigeons and starlings—and cats and dogs; even rats. It is a basic principle of ecology that no habitable niche is empty. There is a correlary that the most difficult niches are inhabited by the fewest species, but that those few species able to survive in a difficult niche tend to be present in large numbers.

The multiple-use concept rests on the generally valid assumption that some degree of diversity in use will better utilize the resource than a single use. Within the best planned and managed multiple-use systems there may often be a principle use. However, the maintenance of a principle-use purpose need not negate other multiple-use purposes. Biologically, a continually recycling system must include decomposers as well as producers. Without such recycling, or man-made supplementation, the resource would be exhausted.

I shall treat the multiple-use concept from three points of view; (1) The multiple

This presentation was given during the 1971 Farmers Week Program, Trenton, New Jersey, January 25, 1971.

use achieved in natural ecosystems without deliberate human intervention; (2) the managed multiple beneficial use of resources (e.g., land, associated water, forests, and grassland – "beneficial" in this case is construed as beneficial use with peripheral or subordinate compatible uses as in agroecosystems.

Every portion of the national environment will, in the absence of human intervention, achieve a balance among plants, animals, and microflora best adapted to each ecosystem. By inference, such a system is most productive; but by what measure? Its net productivity, minus the relatively permanent storage of carbon in humus, peat, lignin, coal, and petroleum, which amounts generally to less than 1% of animal production, is zero.

In today's world and tomorrow's, areas truly undisturbed by man are non-existent. Even though areas may be barred to his direct intrusion, the products of his activities will intrude – chemicals in the rain and snow, smog, noise from over flight, and pollution in water originating outside the wilderness area. We do have some designated wilderness areas and some wildlife refuges here and in other countries to which man's access is limited. The Great Serengeto area in Tanzania is such an area. But elephants are apparently increasing there by migration from other areas. Should their number be stabilized by man? In the United States we have about 10 million acres of wilderness areas, mostly in our national forests. The national forests now contain more than 98% of the National Wilderness Preservation System (61 of the 84 Wildernesses contain 9.9 of the total 10.1 million acres in the system).

A more limited concept of multiple use is the management concept, under which our Forest Service operates by policy and by law. Our Soil Conservation Service and indeed our whole Department of Agriculture advocates and supports this concept. Our national forest and grasslands are managed for the production of timber, of water, of wildlife habitat, of natural beauty, of recreation, and of grazing for livestock. Obviously, the mix of these multiple-use objectives varies from place to place and from time to time. Some sites are of very high value for timber production, some especially suited for wildlife, some for water harvest, and some for grazing, but all large areas contain areas suited to all these purposes. It is very difficult to stabliize all of them at a high level of productivity. Overgrazing by wild herbivores or livestock or a combination of the two decreases grazing capacity, and, when accompanied by erosion, such impairment may last for a long time. Yet there are under-utilized areas; e.g., our steady reduction in sheep population has left some alpine meadows under-utilized.

Protection against diseases, insects, and fire, to the extent that they are successful, tend to slow the rate of change, but they may also decrease productivity unless they are accompanied by the systematic, carefully managed harvest of timber and game. A forest of old, overmature trees is less productive than a forest including a succession of trees and other vegetation at all stages from seedings to climax. On an area basis this might be achieved by even-age management on constituent units. The ways to achieve maximum productivity are still subject to research, demonstration, and reduction to practice in the field. They are also subjects of controversy.

It has been estimated that the management of forest and other woody vegetation could increase water harvest by nine million acre-feet annually (Storey and Reigner, 1970). There are areas such as the Pecos Delta where phreatophytes are heavy, uneconomic users of water. There are mountainous areas where juniper is a negligible economic value, water harvest is of great economic importance, and management for water harvest may have first priority. There are areas in the Rockies where the snowpack is of vital importance to communities and irrigated agriculture in the valleys and plains below. In such areas, extensive tests of applications of cloud seeding – carefully selected storms – seem likely to increase the snowpack by 10 to 15%.

The Forest Service estimates that timber harvest can be increased by 60% by better management of forestlands including private ones. Even city forests, parks, and trees along city streets can contribute to our timber supply and increase their value in recreation, in screening noise and unsightly places, in shade, wildlife habitats, beauty, and rest. Removal of overmature trees before they are rendered useless, dangerous, and unsightly by the physiological changes and diseases accompaning their senescence – thus providing breeding places for the diseases and insect pests which may increase as a threat to younger trees – can reduce costs. Replacing trees with those more resistant to air pollution can help, and research at the USDA Laboratory at Delaware, Ohio, the Pacific Southwest Forest and Range Experiment Station, and in many State laboratories is helping to identify and develop such genetically resistant trees. The New Jersey Agricultural Experiment Station at Rutgers is among the leaders in the study of the effects of air pollution on plants.

The Forest Service embraces this new climate of national concern about the environment as a challenge to carry out the environmental goals to which it has dedicated itself for six decades. Many of the Forest Service's goals were given Congressional endorsement by the 1960 Multiple-Use Sustained Yield Act. This legislation was augmented by the National Environmental Policy Act of 1969, which gave new emphasis to environmental quality. The Forest Service offers the American people "balanced management" for their forests. This balance is defined as full consideration and the best possible management of lands for all uses and activities – wildlife, water production, soil stabilization, timber production, recreation, clean air, forage for cattle and wildlife, solitude, beauty, and even for the protection of many birds, animals, and plants which are losing their fight for survival. Such a balanced program, Forest Service leaders agree, should not produce a high level of one of these goods or services at the expense of another, or at the expense of future generations.

The emphasis in Forest Service management programs in the 1970's will be on quality. The aim in planning and execution is that no actions take place without full knowledge of how they will affect the entire ecosystem. A series of short courses in ecosystem management planning for top- and middle-level management has been initiated. These refresher courses cover basic ecology and updating on systems ecology. They emphasize understanding and use of new systems-analysis techniques which will allow administrators to evaluate management alternatives and to select the best ones, based on complete knowledge of potential impacts on ecosystems. As part of the multifunctional approach to reaching the best management decisions, the Forest Service has stepped up recruitment of specialists in such subjects as hydrology, soil science, wildlife biology, and landscape architecture. It now employs more landscape architects than any other single agency in the United States, and probably the world, and it has more members in the Ecological Society of America than any other organization, public or private.

A Forest Service task force is in the final stages of developing a master plan for integrated land use of national forests in the Southern Appalachians – it could serve as a model for other geographical groupings of national forests in the United States. The purpose of the program is to coordinate planning and consideration of environmental impacts in a six-State area. In this developmental stage of the master plan, a series of public meetings has been held to get a full array of public recommendations.

Forest Service research is being turned more toward understanding the total forest-related environment, again involving multifunctional systems. An example of this approach is the new research program called the Pinchot Institute of Environmental Forestry Research, administered from Upper Darby, Pennsylvania. It is being formed as a coordinated and integrated environmental research program in cooperation with about a dozen northeastern universities.

The Soil Conservation Service, working in every section (almost every county) in the

United States, helps people put the multiple-use concept to work on their private land. More than a thousand small watershed projects are now complete or under construction. Of these, 273 projects include land and water improvements for recreation use. The Soil Conservation Service is providing financial and technical assistance for public recreation use of 402 lakes in 45 States. In 193 of these cases the help is for impounding water, and for the other 209, SCS gives additional assistance such as acquiring surrounding land or developing the recreational facilities of boat ramps, hiking trails, camping areas, etc. Within two to five years when all projects are completed, they will provide more than 13 million user-days of recreation annually. In 1970, SCS provided technical help to landusers for wildlife habitat and wetland management on 5,424,969 acres. The cumulative total for the last four years was 1,400,341 acres.

One part of SCS input is in the waste-disposal field. Whether the material is city trash and sewage, feedlot or poultry waste, or effluent from a processing plant, there are some steps or principles involved in which SCS and local conservation districts have some experience and can be of help. Waste disposal systems of any kind must be *located properly* so they will work as expected. It does little good to put in a septic tank on soils that can't absorb the effluent. And SCS has been gathering information about the soils of this country for many years and providing useful interpretations.

Another vital element is controlling the flow of water across the waste disposal site to avoid erosion damage and water pollution. Many of the conservation practices that SCS has helped farmers install to protect cropland will work equally well on these sites. Sewage lagoons and holding ponds are first cousins to the millions of farm ponds that SCS has helped build. Sprinkler irrigation systems that SCS has helped plan for farm crops now are also of use in spreading wastes on the land for safer disposal or recycling. SCS plant materials centers have helped identify plants that will thrive on these wastes.

The Department's Agricultural Conservation Program has changed its name to Rural Environmental Assistance Program (REAP). The change in name reflects a change in emphasis. REAP, like its predecessor, will be administered by the Agricultural Stabilization and Conservation Service. Production adjustment programs administered by that Agency have resulted in conservation measures on about one million farms each year. In one year, about 48,000 water storage reservoirs were established to provide new fish and wildlife habitat and recreational opportunities. 300,000 acres of trees and shrubs were planted, or timber was improved.

Under the new REAP program, $150 million has been allocated to the States. President Nixon, is signing the USDA 1971 Appropriation Act, emphasized the focus of REAP on the preservation and enhancement of the environment and on providing maximum public benefit at the lowest possible cost. Highest priority is given to support of practices resulting in public benefits such as pollution abatement, recreation, wildlife, open space, and permanent soil and water conservation. Off-farm benefits will be promoted by concentrating funds to solve community environmental problems through special projects and pooling agreements. Funds available to a community could be used to establish permanent cover and other water control measures on a farmland watershed to reduce the rate of siltation in a municipal water supply reservoir.

Monoculture, a third system not generally considered to be multiple-use, is a simplistic assumption achievable, if ever, only in sterilized hydroponics or sand-culture systems in controlled environmental growth chambers. Yet the trend toward monoculture – commodity production specialization – is very real in many areas. Factors which have contributed to this trend include economies to be achieved by large acreages for the effective use of machinery; the high economic benefit: cost relationship in the use of agricultural chemicals; the development of genetically high-yield crops under optimal conditions of water, fertilization

and timely cultivation; and susceptibility to mass mechanical harvest. Nevertheless these cotton, corn, rice, and wheat production systems do include limited multiple use. The unharvested, ungleaned corn feeds pheasants and wild geese, the rice field may produce fish in alternate years, and in favorable years, wheat fields produce winter grazing.

But monoculture is conducive to the propagation of weeds, insects, and disease, thus increasing risks. Chemical control is not a product of monoculture, but surely it could be lessened by some diversity in planting; e.g., interspersion of green, growing alfalfa strips in California cotton fields as a trap crop for lygus bugs. Monoculture has special problems which in some cases could be ameliorated by multiple use. Remember, however, that rice has been grown in terrace paddies in Asia year after year for 2,000 years or more. Interestingly, blue-green algae seem to contribute a substantial portion of their meager nitrogen supply.

Multiple use of our land and its associated waters is a concept which is the policy of the USDA and its programs. Variants must take into account the proprietary interests of land owners, the interests of communities, and finally of the public generally, including the generations to come. We have land enough and water, too, in the United States if we use them wisely. Wise use will require careful planning and management.

The States must have a lead role in the development of land-use planning and policy. This planning and policy must include consideration of the soil capacity of the land for agricultural and non-agricultural purposes and location of the land with respect to water management. Flood control, water harvest, and associated wetland and water habitats for fish and wildlife must be considered. Urbanization, industry, open space, and recreational needs and opportunities must be evaluated. Among the many purposes for which land increasingly must be used is the disposal, preferably beneficial, of wastes from our agriculture and from our cities.

The interests of land owners, of communities, and of the general public – all must be served. The identification and retention of prime farm land for agricultural use is important. Some agricultural uses of such land near cities can contribute to open space and some recreational requirements, while forested land near our cities can continue to provide habitat for birds and wildlife accessible to observation by city people.

Reference Cited

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